IN THE CLAIMS

1.   (Currently Amended) A non-linear optical system for imaging an object comprising:

optics for focusing and encoding a wavefront from the object to an intermediate image such that an optical transfer function of the optical system, at the intermediate image, is more invariant to focus-related aberrations as compared to an intermediate image formed by the optics without encoding;

a non-linear detector for detecting the intermediate image, the non-linear detector having an intensity threshold, wherein any part of the intermediate image that is below the intensity threshold is not detected by the nonlinear detector; and

a linearization processor for linearizing the intermediate image to form a linearized image.

2.   (Original) The optical system of claim 1, wherein the optics comprise a phase mask that modifies the optical transfer function of the optical system by affecting phase of the wavefronts transmitted by the phase mask.

3.   (Original) The system of claim 1, wherein the aberrations include one or more of misfocus, spherical aberration, astigmatism, field curvature, chromatic aberration, temperature induced misfocus aberration, and pressure induced misfocus aberration.

4.   (Original) The system of claim 1, wherein the non-linear detector comprises film.

5.   (Canceled)

6.   (Original) The system of claim 1, wherein the optics comprise an optical element with an aspheric phase profile.

7. (Currently Amended) The system of claim 5 6, wherein the optical element is positioned at one or more of a principal plane of the imaging system, an image of the principal plane, an aperture stop of the imaging system, and an image of the aperture stop.

8. (Previously Presented) The system of claim 1, further comprising a post processor for filtering the linearized image by removing effects of wavefront coding therefrom to form a final image.

9. (Previously Presented) The system of claim 1, wherein the linearization processor linearizes the intermediate image by measuring an exposure curve within an image detected by the non-linear detector and by converting the exposure curve into a substantially linear exposure curve.

10. (Original) The system of claim 9, the exposure curve comprising an overexposed region and an underexposed region, wherein any part of an image falling into the underexposed region or the overexposed region is not recorded by the detector.

11. (Original) The system of claim 1, the non-linear detector comprising a non-linear digital detector.

12. (Currently Amended) The system of claim 9 11, wherein the non-linear digital detector comprises CMOS detector elements and circuitry to extend dynamic range.

13. (Currently Amended) The system of claim 9 11, wherein the non-linear digital detector comprises a digital circuit with different responses for different pixels.

14. (Currently Amended) The system of claim 9 11, wherein the non-linear digital detector comprises a digital circuit with detectors having logarithmic response.

15. (Currently Amended) A method for reducing aberrations in a wavefront imaged by an optical system having a non-linear detector, comprising:

encoding a wavefront of electromagnetic radiation from an object imaged to the
non-linear detector;

digitally converting data from the non-linear detector to form a digital representation
of the image captured by the detector;

linearizing the detected image to form a linearized image <u>wherein said step of</u>
<u>linearizing comprises the steps of measuring an exposure curve for the image</u>
<u>detected by the non-linear detector and converting the exposure curve into a</u>
<u>substantially linear exposure curve</u>; and

filtering the linearized image to reverse effects of wavefront coding to form a final
image.

16.   (Previously Presented) The method of claim 15, wherein the step of
encoding a wavefront comprises the step of coding the wavefront with a phase mask that
modifies the optical transfer function of the optical system by affecting the phase of the
wavefront transmitted by the phase mask.

17.   (Canceled)

18.   (Previously Presented) The method of claim 15, wherein linearizing the
detected image comprises the step of:

determining the approximate value of the highest density in the image detected by
the non-linear detector;

wherein converting the exposure curve into a substantially linear exposure curve
comprises:

generating a look up table by solving for integer values on the exposure curve
between the approximate highest density value and a low density value; and

mapping the values in the look up table onto the substantially linear exposure curve.

19.   (Previously Presented) The method of claim 15, wherein filtering the
linearized image of the wavefront is performed by a filter defined by the Fourier-domain
equation:

$$P(v, \xi) = \frac{W(v, \xi) H^{\cdot}(v, \xi)}{H(v, \xi) H^{\cdot}(v, \xi) + \sigma}.$$

where F(v, ξ) is the filter, W is the ideal diffraction-limited optical transfer function, H is the input data (H* is the complex conjugate of H), and σ is the Weiner parameter.

20.　(Previously Presented)　The method of claim 15, wherein the aberrations include one or more of misfocus, spherical aberration, astigmatism, field curvature, chromatic aberration, temperature induced misfocus aberration, and pressure induced misfocus aberration.

21.　(Previously Presented)　The method of claim 15, wherein the non-linear detector is an analog film.

22.　(Currently Amended)　The method of claim 15, wherein ~~modifying~~ encoding the wavefront comprises utilizing a phase mask.

23.　(Original)　A method for reducing aberrations in a wavefront imaged by an optical system having a non-linear detector, comprising:

setting an intensity threshold of the non-linear detector, wherein any part of an intermediate image below the intensity threshold is not detected by the non-linear detector;

encoding a wavefront of electromagnetic radiation from an object imaged to the non-linear detector;

digitally converting data from the non-linear detector to form a digital representation of the image captured by the detector;

linearizing the detected image to form a linearized image; and

filtering the linearized image to reverse effects of wavefront coding to form a final image.

24.　(Previously Presented)　The method of claim 23, wherein the step of encoding a wavefront comprises the step of coding the wavefront with a phase mask that modifies the optical transfer function of the optical system by affecting the phase of the wavefront transmitted by the phase mask.

25.   (Previously Presented) The method of claim 23, wherein the step of linearizing the detected image comprises the steps of measuring an exposure curve for the image detected by the non-linear detector and converting the exposure curve into a substantially linear exposure curve.

26.   (Previously Presented) The method of claim 23, wherein linearizing the detected image comprises the step of:

> determining the approximate value of the highest density in the image detected by the non-linear detector;

> wherein converting the exposure curve into a substantially linear exposure curve comprises:

> generating a look up table by solving for integer values on the exposure curve between the approximate highest density value and a low density value; and

> mapping the values in the look up table onto the substantially linear exposure curve.

27.   (Previously Presented) The method of claim 23, wherein filtering the linearized image of the wavefront is performed by a filter defined by the Fourier-domain equation:

$$F(\nu, \xi) = \frac{W(\nu, \xi) H^*(\nu, \xi)}{H(\nu, \xi) H^*(\nu, \xi) + \sigma},$$

> where $F(\nu, \xi)$ is the filter, W is the ideal diffraction-limited optical transfer function, H is the input data (H* is the complex conjugate of H), and σ is the Weiner parameter.

28.   (Previously Presented) The method of claim 23, wherein the aberrations include one or more of misfocus, spherical aberration, astigmatism, field curvature, chromatic aberration, temperature induced misfocus aberration, and pressure induced misfocus aberration.

29.   (Previously Presented) The method of claim 23, wherein the non-linear detector is an analog film.

30.   (Previously Presented) The method of claim 23, wherein modifying the wavefront comprises utilizing a phase mask.

31.   (Canceled)

32.   (Currently Amended) The system of claim ~~31~~1, wherein the optical element is positioned at one or more of a principal plane of the imaging system, an image of the principal plane, an aperture stop of the imaging system, and an image of the aperture stop.

33.   (Currently Amended) The system of claim ~~31~~1, wherein the linearization processor linearizes the intermediate image by measuring an exposure curve within an image detected by the non-linear detector and by converting the exposure curve into a substantially linear exposure curve.

34.   (Previously Presented) The system of claim 33, the exposure curve comprising an overexposed region and an underexposed region, wherein any part of an image falling into the underexposed region or the overexposed region is not recorded by the detector.

35.   (Previously Presented) The system of claim 33, wherein the non-linear digital detector comprises CMOS detector elements and a circuitry to extend dynamic range.

36.   (Previously Presented) The system of claim 33, wherein the non-linear digital detector comprises a digital circuit with different responses for different pixels.

37.   (Previously Presented) The system of claim 33, wherein the non-linear digital detector comprises a digital circuit with detectors having logarithmic response.

38.   (New) A non-linear optical system for imaging an object comprising:
          optics for focusing and encoding a wavefront from the object to an intermediate image such that an optical transfer function of the optical system, at the intermediate image, is more invariant to focus-related aberrations as compared to an intermediate image formed by the optics without encoding, the optics comprising an optical element with an aspheric phase profile and

being positioned at one or more of a principal plane of the imaging system, an image of the principal plane, an aperture stop of the imaging system, and an image of the aperture stop;

a non-linear detector for detecting the intermediate image; and

a linearization processor for linearizing the intermediate image to form a linearized image.

39.   (New) The system of claim 38, further comprising a post processor for filtering the linearized image by removing effects of wavefront coding therefrom to form a final image.

40.   (New) The system of claim 38, the non-linear detector comprising a non-linear digital detector.